

REMARKS/ARGUMENTS

New Claims 16-41 have been added to provide more comprehensive protection for Applicants' invention.

Accordingly, Claims 1-41 are pending in the application.

The new claims are fully supported by the disclosures of the specification and the original claims.

New independent Claims 16 and 36 are patentable over the references applied in the previous Office Action. The deficiencies of the Watanabe reference have been discussed in the previous response. Specifically, the Watanabe reference does not anticipate the claimed method of preparing a patterned wiring layer on a substrate because it does not disclose etching a metal film containing an aluminum alloy with a plasma of a gas mixture containing Cl₂ gas, BCl₃ gas, and an added shape-controlling gas containing a chlorinated hydrocarbon gas, wherein the chlorinated hydrocarbon is CH₂Cl₂. Furthermore, the other references applied in combination with Watanabe to reject certain of the original claims, i.e., the Abraham, Collins, and Davis references, are also silent with regard to plasma etching of aluminum alloy films using CH₂Cl₂. Consequently, these references, taken individually or in combination, do not

render new independent Claims 16 and 34, and the claims dependent therefrom, unpatentable.

Moreover, as pointed out in the response filed on November 24, 2003, the evidence presented in the specification at page 9, lines 1-13, and summarized in Figure 3 shows that the claimed process using CH₂Cl₂, as an additive gas achieves a substantial reduction in critical dimension (CD) shift together with an increase in etching rate as compared with the prior art method using PR gas (mixture of CH₄ and Ar, specification, page 7, lines 6-7). This improvement is not taught or suggested by the disclosures of the applied references, taken individually or in combination. Accordingly, new Claims 16-41 are patentable over the applied references.

Furthermore, the Watanabe reference does not discuss formation of protective sidewalls on etched surfaces when a chlorinated hydrocarbon is used as an added shape-controlling gas. Watanabe's examples are limited to the use of CH₄, i.e., a hydrocarbon gas, optionally with added argon gas, as an added shape-controlling gas. Under these conditions, the sidewall protective film contains organic components, such as C, CH, etc., and is removed in a subsequent resist ashing step (column 7, lines 29-32;

column 8, lines 11-15). In Applicant's specific method of preparing a patterned metallic layer on a substrate, as claimed in new claims 32-33 and 40-41, the protective sidewall film is removed by a chemical washing step, preferably using a solution of acetic acid and aqueous ammonia (page 9, lines 17-20; page 11, lines 22-25). In such a process, as discussed at page 9, line 20 - page 10, line 9, an added shape-controlling gas containing CH_2Cl_2 , produces a sidewall protecting film that is removable after etching by a chemical washing step, whereas an added shape-controlling gas containing CH_2Br_2 , produces a sidewall protecting film that cannot be readily removed by such a washing step. The Watanabe reference, as well as the secondary references, are silent regarding removal of any sidewall protective film formed when a chlorinated or brominated hydrocarbon is used as an added shape-controlling gas, as well as any differences in the removability of such a sidewall protective film due to such use of a chlorinated or brominated hydrocarbon.

Consequently, Applicants have disclosed and claimed a process that is not taught or suggested by the applied references, and solved a problem arising in their novel process that was not taught or suggested by those

references. Accordingly, Applicants' claimed process as recited in new Claims 32-33 and 40-41 is neither anticipated nor made obvious by the disclosures of Watanabe, taken alone or in combination with the other references, and the patentability of those claims is specifically urged.

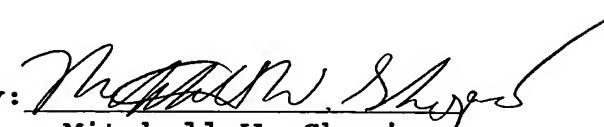
Furthermore, Applicants have shown that Watanabe's general disclosure to the effect that his process for plasma etching of metal layers using CH₄, with or without added Ar, as an added shape-controlling gas would be useful in general for preparing wiring layers including conductors having a width of 0.5 μm or less (Watanabe, column 7, lines 64-65, does not extend to such wiring layers wherein the width of the conductors is 300 nm or less. As discussed in the specification at page 13, lines 6-15, and summarized in Figure 8, the use of a CH₄-Ar mixture as an added shape-controlling gas produces sidewall undercut at wiring pitches somewhat less than 500 nm, specifically at least at wiring pitches of 300 nm or less. On the contrary, Applicants' method of etching a metal layer using CH₂Cl₂ as an added shape-controlling gas shows no undercutting at least down to a wiring pitch of 200 nm. Such a result is not disclosed or suggested by Watanab or

any of the other references applied against the original claims. Accordingly, new claims 23-25 are patentable over the disclosures of those references and the patentability of those claims is specifically urged.

In view of the above amendments and discussion, this application is believed to be in condition for allowance, and an early Notice of Allowance is respectfully requested.

The Commissioner is hereby authorized to charge to Deposit Account No. 50-1165 any fees under 37 C.F.R. § 1.16 and 1.17 that may be required by this paper and to credit any overpayment to that Account. If any extension of time is required in connection with the filing of this paper and has not been requested separately, such extension is hereby requested.

Respectfully requested,

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